

High-Pressure Decisions: Recognition and Management of Uncommon Hand Injuries

Daniele Michelle Bourget · Jeanmarie Perrone

Published online: 12 November 2010
© American College of Medical Toxicology 2010

Keywords High pressure injection injuries · Uncommon hand traumatisms · Toxicology · Latex paint injection

Clinical Case

A 52-year-old right-handed male painter presented to an emergency department with a complaint of left hand pain and swelling. One day prior to presentation, the patient unintentionally injected paint into the middle finger of his left hand while working with a high-pressure paint gun. He reported minimal complaints immediately after the trauma, but over the next several hours developed fever, increasing pain, and swelling of his finger and hand and red streaking up his left arm. In the emergency department, he was afebrile and slightly tachycardic (104 beats/min). He reported significant left hand pain (10/10 severity). Physical examination revealed a sub-centimeter puncture wound with a cyanotic appearance on the distal volar surface of his

left middle finger, which was markedly edematous (Fig. 1). Range of motion was limited by pain and swelling at the distal and proximal interphalangeal joints, and he had multiple linear erythematous streaks extending from the middle finger to the palm and all of the way up to the left axilla. Radiograph of the left hand showed marked soft tissue swelling around the third finger and extensive volar soft tissue radiodensities (Fig. 2). The patient was intravenously treated with vancomycin and ampicillin-sulbactam, tetanus prophylaxis, and opioid analgesics, and a surgical consultation was obtained for emergent surgical exploration and irrigation.

Answer/Discussion

High-pressure injection (HPI) injuries result from the introduction of foreign substances into the skin to underlying tissues by high-pressure mechanical tools. These tools can exert forces up to 10,000 psi causing chemicals to breach the skin and rapidly diffuse along fascial planes, tendon sheaths, and neurovascular bundles. These injected chemicals incite significant damage via mechanical impact, inflammatory responses, compartment syndrome, ischemia, and by a direct toxic, irritant effect [1, 2]. Substances commonly imbued include both oil- and water-based paints, automotive grease, and cleaning solvents. Less viscous substances, such as cleaning solvents and paint thinners, may cause additional damage [3, 4]. Latex paint, which this patient was using, may not be as destructive to tissues [5].

There was no outside funding of any kind used for this study.

D. M. Bourget (✉)
School of Medicine, University of Pennsylvania,
Philadelphia, PA, USA
e-mail: dbourget@mail.med.upenn.edu

J. Perrone
Division of Medical Toxicology, School of Medicine,
University of Pennsylvania,
Philadelphia, PA, USA
e-mail: jeanmarie.perrone@uphs.upenn.edu



Fig. 1 Sub-centimeter puncture wound with a cyanotic appearance on the distal volar surface of his *left middle finger*, which was markedly edematous



Fig. 2 Radiograph of the *left hand* showing marked soft tissue swelling around the *third finger* and extensive volar soft tissue radiodensities

Overall prognosis and outcome appears to be related to the substance injected, the pressure exposure, the digit involved, and the time delay to surgical care. Poor functional outcomes and digital amputation are common. Patients with HPI injuries are often young male laborers, and experience trauma of the non-dominant hand, often while attempting to unclog the nozzle of the gun. Initial symptoms, which are generally unimpressive, include a small puncture wound at the site of injury with minimal complaints of pain. Hours after the injury increasing pain, swelling, lymphangitic spread, fever, loss of function, and neurological impairment can develop. HPI injury management should include radiographs as well as evaluation for possible infection, tenosynovitis, or abscess [1]. Radiographs may demonstrate radiodense material, subcutaneous air, debris, and fractures. Although most substances are visualized at the site of injury, the extent of material in tissues is often underestimated radiographically. Broad spectrum antibiotics, tetanus prophylaxis, and analgesia should be initiated in the ED, but definitive therapy is surgical exploration, irrigation, and debridement to prevent tissue necrosis and subsequent amputation. Early recognition, hand surgery consultation, and prompt surgical intervention are the key to successful management [6].

Conflict of interest The authors have no potential financial conflicts of interest to report.

References

- Verhoeven N, Hierner R (2008) High-pressure injection injury of the hand: an often underestimated trauma: case report with study of the literature. *Strateg Trauma Limb Reconstr* 3(1):27–33
- Fialkov JA, Freiberg A (1991) High pressure injection injuries: an overview. *J Emerg Med* 9(5):367–371
- Arneja JS, Rennie W, Turner RB, Waters WR, Toy J (2009) High-pressure injection injuries. eMedicine Orthopedic Surgery. Jul 8. Retrieved 6/2/10
- Saraf S (2009) Case study: high-pressure injection injury of the finger. *Indian J Orthop*. June 25
- Lozano-Calderón SA, Mudgal CS, Mudgal S, Ring D (2008) Latex paint-gun injuries of the hand: are the outcomes better? *Hand* 3:340–345
- Glen V (2009) Hand injury, high pressure. eMedicine Emergency Medicine. Oct 10. Retrieved 6/2/10